

## Description

This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirement of Automotive Applications.

## Features

- $BV_{CEO} > -60V$
- $I_C = -1A$  High Continuous Collector Current
- $I_{CM} = -2A$  Peak Collector Current
- $R_{CE(SAT)} = 295m\Omega$  for a Low Equivalent On-Resistance
- $h_{FE}$  characterized up to 2A for high current gain hold up
- Complementary NPN Type: FCX491
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

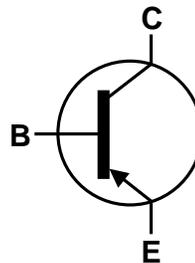
## Mechanical Data

- Case: SOT89
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 <sup>(e3)</sup>
- Weight: 0.05 grams (Approximate)

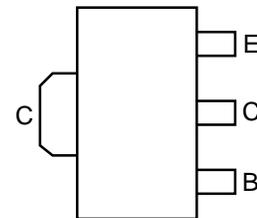
SOT89



Top View



Device Symbol



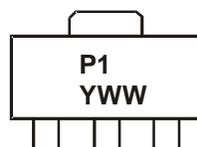
Top View  
Pin Out

## Ordering Information (Notes 4 and 5)

Product	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
FCX591QTA	P1	7	12	1,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/product-compliance-definitions/>.
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



P1 = Product Type Marking Code  
 YWW = Date Code Marking  
 Y = Last digit of year (ex: 7 = 2017)  
 WW = Week code (01 – 53)

### Absolute Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Limit	Unit
Collector-Base Voltage	V <sub>CB0</sub>	-80	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-60	V
Emitter-Base Voltage	V <sub>EBO</sub>	-7	V
Continuous Collector Current	I <sub>C</sub>	-1	A
Peak Pulse Current	I <sub>CM</sub>	-2	A
Base Current	I <sub>B</sub>	-200	mA

### Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

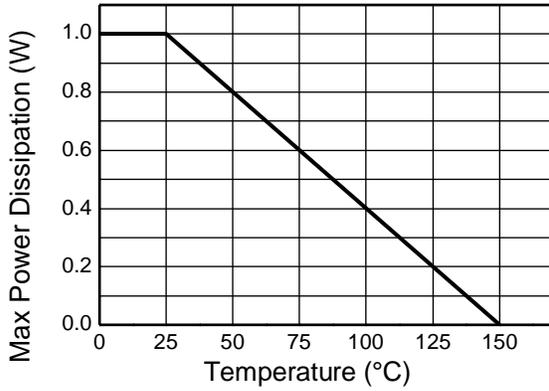
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 6)	1
		(Note 7)	1.5
		(Note 8)	2.0
Thermal Resistance, Junction to Ambient Air	R <sub>θJA</sub>	(Note 6)	125
		(Note 7)	83
		(Note 8)	60
Thermal Resistance, Junction to Lead	R <sub>θJL</sub>	22	°C/W
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	16	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-65 to +150	°C

### ESD Ratings (Note 11)

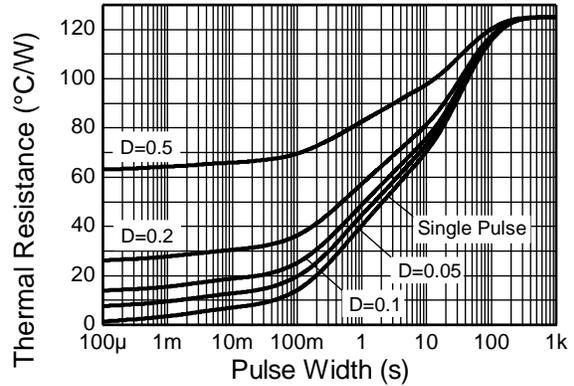
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
6. For a device mounted with the exposed collector pad on 15mm x 15mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  7. Same as Note 6, except the device is mounted on 25mm x 25mm 1oz copper.
  8. Same as Note 6, except the device is mounted on 50mm x 50mm 1oz copper.
  9. Thermal resistance from junction to solder-point (on the exposed collector pad).
  10. Thermal resistance from junction to the top of the case.
  11. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

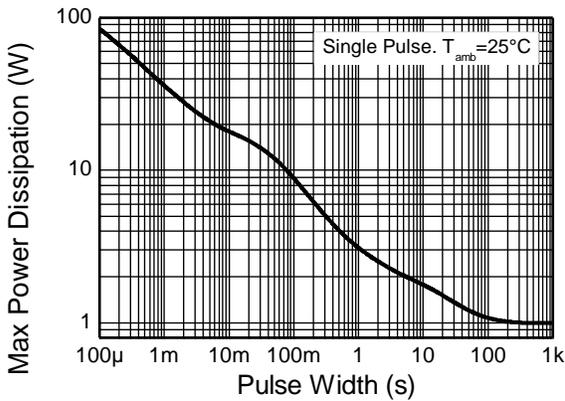
**Thermal Characteristics and Derating Information**



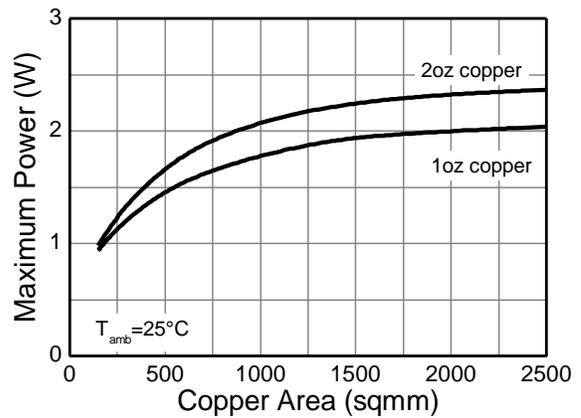
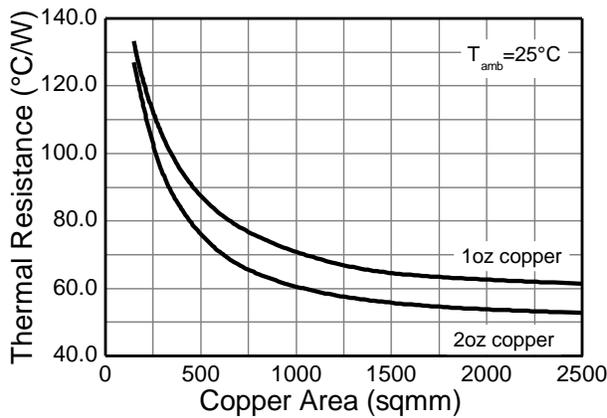
**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

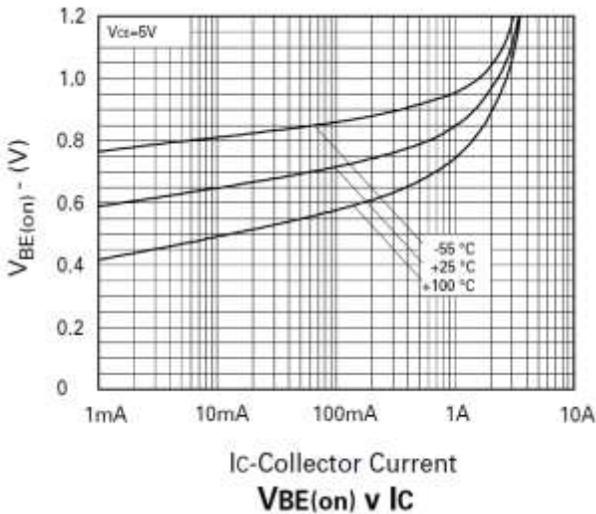
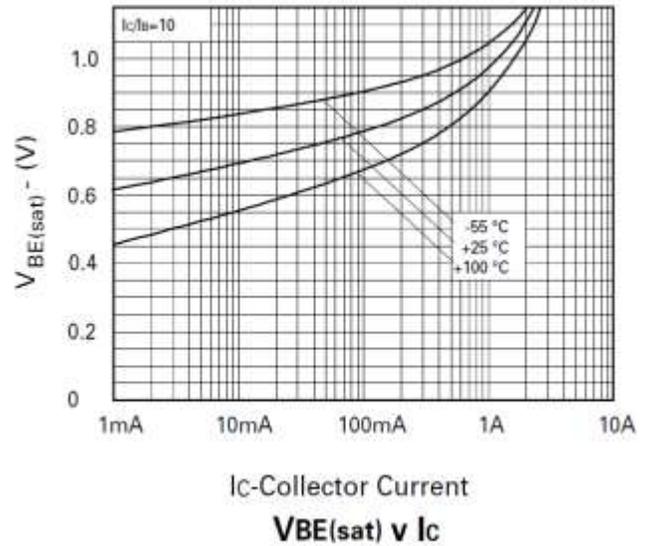
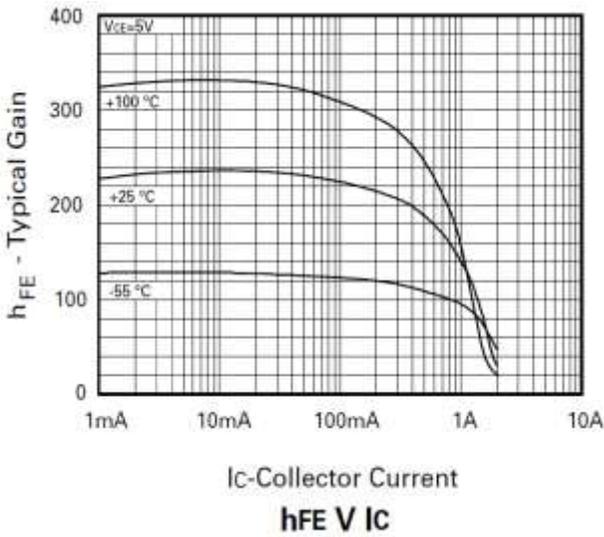
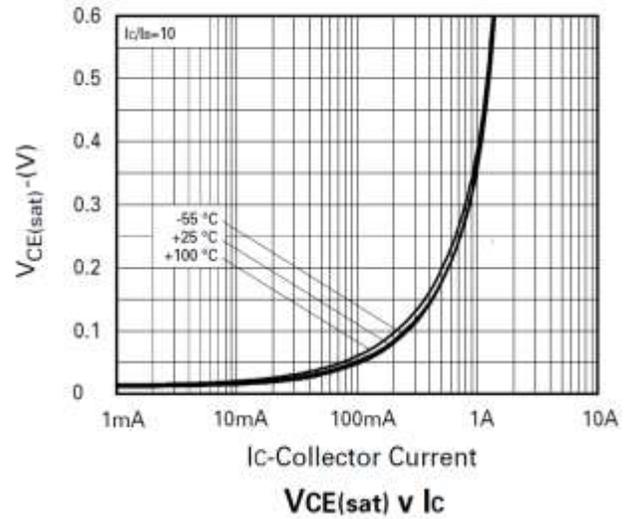
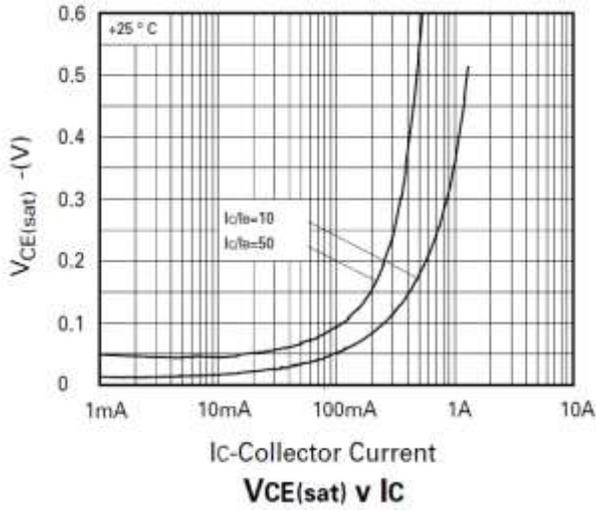


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	-80	—	—	V	I <sub>C</sub> = -100μA
Collector-Emitter Breakdown Voltage (Note 12)	BV <sub>CEO</sub>	-60	—	—	V	I <sub>C</sub> = -10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-7	-8.1	—	V	I <sub>E</sub> = -100μA
Collector Cutoff Current	I <sub>CBO</sub>	—	<1	-100	nA	V <sub>CB</sub> = -60V
Emitter Cutoff Current	I <sub>EBO</sub>	—	<1	-100	nA	V <sub>EB</sub> = -5.6V, I <sub>C</sub> = 0
Emitter Cutoff Current	I <sub>CES</sub>	—	<1	-100	nA	V <sub>CES</sub> = -60V
DC current transfer Static ratio (Note 12)	h <sub>FE</sub>	100 100 80 15	220 175 155 40	— — 300 —	—	I <sub>C</sub> = -1mA, V <sub>CE</sub> = -5V I <sub>C</sub> = -500mA, V <sub>CE</sub> = -5V I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V I <sub>C</sub> = -2A, V <sub>CE</sub> = -5V
Collector-Emitter Saturation Voltage (Note 12)	V <sub>CE(sat)</sub>	—	-155 -295	-300 -600	mV	I <sub>C</sub> = -500mA, I <sub>B</sub> = -50mA I <sub>C</sub> = -1A, I <sub>B</sub> = -100mA
Base-Emitter Saturation Voltage (Note 12)	V <sub>BE(sat)</sub>	—	-965	-1,200	mV	I <sub>C</sub> = -1A, I <sub>B</sub> = -100mA
Base-Emitter Turn-on Voltage (Note 12)	V <sub>BE(on)</sub>	—	-830	-1,000	mV	I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V
Transitional Frequency	f <sub>T</sub>	150	—	—	MHz	I <sub>E</sub> = -50mA, V <sub>CE</sub> = -10V f = 100MHz
Output capacitance	C <sub>obo</sub>	—	—	10	pF	V <sub>CB</sub> = -10V, f = 1MHz,

Note: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

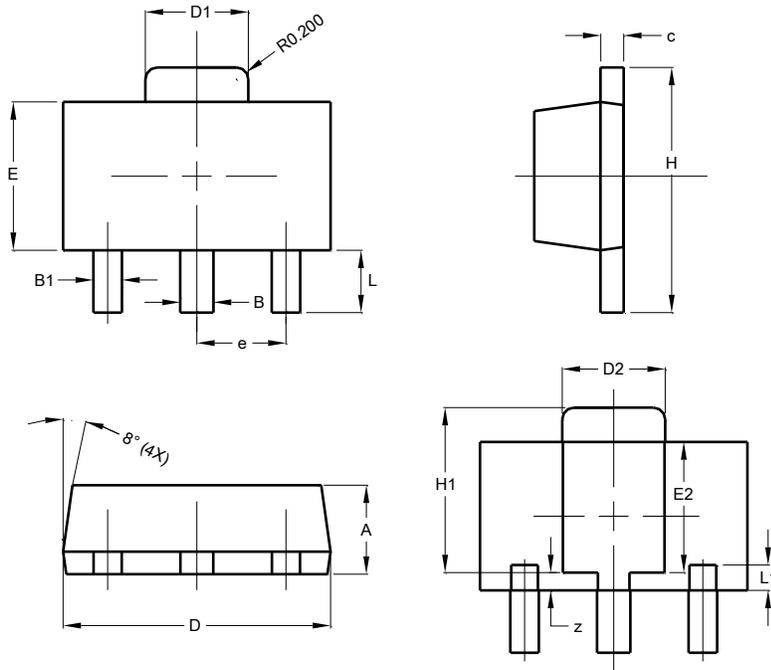
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT89**

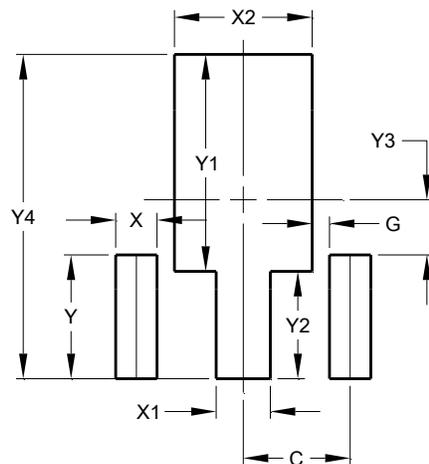


SOT89			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
B	0.50	0.62	0.56
B1	0.42	0.54	0.48
c	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.62	1.83	1.733
D2	1.61	1.81	1.71
E	2.40	2.60	2.50
E2	2.05	2.35	2.20
e	-	-	1.50
H	3.95	4.25	4.10
H1	2.63	2.93	2.78
L	0.90	1.20	1.05
L1	0.327	0.527	0.427
z	0.20	0.40	0.30
All Dimensions in mm			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT89**



Dimensions	Value (in mm)
C	1.500
G	0.244
X	0.580
X1	0.760
X2	1.933
Y	1.730
Y1	3.030
Y2	1.500
Y3	0.770
Y4	4.530

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